THE COUNCIL FOR TOBACCO RESEARCH - USA

PROGRESS REPORT

BY

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PROGRESS REPORT TO THE COUNCIL FOR TOBACCO RESEARCH - USA

In Houston, Texas in 1967, a collaborative study was begun between the Department of Statistics of the Houston Health Department and the Department of Epidemiology of the University of Texas System Cancer Center, M. D. Anderson Hospital at Houston. In the several years following, each of the 235,000 deaths from every cause for 30 years from January 1940 to January 1970 were coded to the rubrics from the U. S. Bureau of the Census in effect in 1967. The introduction of new rubrics every few years in the International Classification of Diseases and Causes of Death makes studies over a period of years difficult and often imprecise. A uniform nomenclature applied to thirty years of consecutive records nets homogeneity of classification and thus accuracy.

The address on each certificate was census tracted to the 1967 census tracts in Houston. The original rubric coded was carried in a separate place on the card as was the secondary cause of death when it was given. Because of local concern in the increasing pollution observed as the population tripled and industry expanded, asthma, bronchitis and emphysema were coded separately when they were mentioned.

Concurrently with the mortality study, the incidence of cancer in Harris County and 71 other counties was being ascertained in a separate study. Cancer records from all the general hospitals, laboratories and clinics in Harris County (Houston) were indexed and abstracted for the

23 year inclusive period from 1944 through 1966. Comparison of the diagnosis in the hospitalized cases with the reported cause of death resulted in many corrections through the cooperative efforts of the Health Department and the physicians. The death records were then coded for Mexican-American surnames, edited, checked and taped in the Department of Epidemiology at the M. D. Anderson Hospital.

The census tracts, their populations, the cancer records and the general mortality records were then assembled in regions around the 17 air pollution sample collection stations. Age specific and adjusted rates were computed for each cause of death for each region in the city, by sex and ethnic group. Table I gives the rates for heart, cancer, stroke and cancer of the lung and cancer of the total respiratory tract for each region for the five year period 1965-1969.

There are enormous regional differences within the city in mortality from cancer of the lung and from heart disease. In an attempt to understand the underlying causes of these regional differences, such demographic factors as number of years of residence in the same house or the same census tract, the general age range, the ethnic composition and the median income have been studied and compared.

The rates in certain regions are high whether the median ages of the residents are relatively young or old. The River Oaks and Memorial

regions have low lung cancer rates, fall in the older age group and have a high median income. The contiguous region south of River Oaks between Main, Old Main and Chocolate Bayou also has a low mortality rate for lung cancer, has the same older population, a large proportion of long-time residents, but a very low median income.

The rates are highest for the center city and the Heights and for the Spring Branch region. The rates in the last region have doubled in 15 years since the entry of heavy industry into the area. The ages of the inhabitants are in the younger category.

The industrial area between Griggs Road, Walker and Chocolate Bayou, has a very high rate of lung cancer. West of Mykawa the age is young and there is much heavy industry. The rates for lung cancer are high.

The region on the other side of Mykawa, mostly residential, with many long-time established areas has a middle range income and a low lung cancer rate. The regions with low rates are out of the path of the usual prevailing winds carrying pollution and have little or no industry within their borders. Presence or absence of atmospheric pollution seems to be the major difference between regions of high and regions of low lung cancer mortality. The annual wind rosettes of the Houston Health Department show that for most of the year the winds carry industrial pollution over the center city and then in a westerly direction.

Some indication of the potential of atmospheric pollution may be derived from observing the change in lung cancer mortality before and after heavy industry moves into a residential area. In the Spring Branch area, for example, the rate has more than doubled in 10 years. Since the rates among women are so much lower than among men it is possible that a combination of the effects of occupational exposure and atmospheric pollution may account for the high rates among males.

In any sound study one must be constantly aware of the movement of populations as well as of industries. Studies similar to this and demographic studies invariably provide clues relative to other areas and population subgroups requiring further investigation.

It is apparent that there is a large area of scientific unknowns relative to the long term health effects from the complex micro-chemical environment. Thousands of chemicals and chemical combinations exist, the effects of which constitute scientific unknowns. There is no simplistic answer to the cause of cancer.

Cancer of the liver in Houston is being studied by region, occupation, and types of exposure to explore the possibility of vinyl chloride as an etiologic factor. These studies point out the need for the scientific community to redirect its attention and research efforts to the exploration of the carcinogenic potential of the micro-chemical environment - a virtually unexplored area.

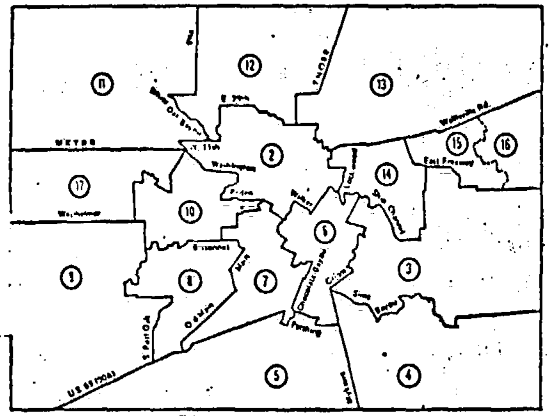
Seven members of the Air Control Board of the Environmental Protection Agency in Austin met with the Professor of Epidemiology and released the detailed pollution emission records from Houston industries. The Board is collecting and analyzing a number of compounds and its highest aerosol readings are in the regions with high rates for lung cancer. The Board is discussing a method of continuing the data base from 1970 through and beyond 1974. The number and type of business establishments with the numbers of employees and whether the businesses were established before or since 1960 is known for each of the 17 regions. Reports are being finalized on this study.

As an educational tool, 26 graduate students of the University of Texas School of Public Heath in Houston have used the Houston mortality data or the registry data for their advanced degrees, both doctors and masters. There have been 23 other users of the data for various educational and planning purposes. This includes teaching high school, college and medical students.

Computerizing and visual availability of all the facts on 235,000 death certificates for 30 years serve as an administrative tool releasing employees for other functions. In a city of over one million population, daily requests for individual death certificates run into the hundreds. There was no index before this study.

The request to the Council for assistance in data processing arose when the regional medical programs in the U. S. were unexpectedly cut-off leaving the Department of Epidemiology with 350,000 accessions to be processed and without adequate personnel to process them. The funds requested and received were used to complete coding of these abstracts, to combine all the charts of the individuals represented more than once who had more than one cancer or who had been to more than one institution for diagnosis or treatment.

The editing netted coded material for 250,000 individuals for 72 counties or 7 regions made up of the combined counties around the medical center. Programs were written for figuring the age specific and age adjusted rates by site of cancer by sex and by ethnic group for each of the regions. The first adequate skin cancer figures complete for a population were obtained from this material and have been used by the Climatic Impact Committee of the National Research Council in studying the effects of the Supersonic Transport in checking the climate. A report on multiple primary cancer has also been published from this material. A librarian has assembled and kept current coverage of the cancer and epidemiological literature since 1946. This is divided up by its relationship to specific anatomic sites. The additional support is sought to elicit environmental factors as they apply to cancer by site in different regions in Texas and to publish a book on the subject.



Houston's Ship Channel Area Rates Low

Study Shows Most Lung Cancer Deaths Occur Among Spring Branch Residents

BY MARY LU ZUBER
Chronicle Staff

The Spring Branch area has the highest incidence of deaths from lung cancer in the city, a statistical study by a Houston woman shows.

The lowest incidence occurs in the Greens Bayou area, between the Ship Channel and Wallisville Rd., near the East Freeway (U.S. 59). The next lowest is in the River Oaks region, just west of the inner city.

The study aims at identifying regional patterns in deaths from lung cancer and heart disease. It took four years to compile information and the statistics, spanning 30 years, still are in the final analysis.

The privately funded study is being done by Eleanor J. Macdonald, chairman of the epidemiology department at the University of Texas M.D. Anderson Hospital and Tumor Institute. Epidemiology is the science dealing with population and diseases. Prof. Macdonald is a pioneer in statistical studies, dealing particularly with cancer, and has been recognized nationally for her work.

She and a staff of eight started combing through the City of Houston records in 1967 checking all causes of death back to 1940. (The city death records don't include those of Galena Park and Pasadena.)

Prof. Macdonald looked more closely at the population within the 16 air pollution collection sample areas of the city. She compiled figures on the ages of residents, the length of time lived in the area, incomes, ethnic and sex differences in the incidences of death.

The figures are voluminous and she's still summarizing the meaning of all the data, but basically the study shows that as an area urbanizes, the incidence of lung and heart diseases rises.

She's particularly interested in determining the role of air pollution in lung cancer. In most cases, her study shows the incidence of heart disease is high in the same areas that lung cancer is.

Atmospheric pollution seems to be the major difference in the high and low regions of lung cancer deaths, she says.

Oddly, the study seems to show that the danger lies not so much in where the pollution originates but in where it drifts with the prevailing winds.

Although the study spans 30 years, the figures in the table are for the latter five-year period, from 1965 to 1969.

The highest incidences of lung cancer deaths occur in Spring Branch, the inner city and the Heights, slightly northwest of downtown.

"These are in the path of the prevailing winds carrying pollution," she says, in reference to emissions from the heavy concentration of industries along the Ship Channel.

She also thinks the entry of heavy industry into Spring Branch, the increased commuter traffic on Katy Freeway (Interstate 10 West) and truck traffic on Hempstead Highway play major roles in the rising rate of lung cancer deaths.

In 1950, the population of the Spring Branch area was 21,000. It quadrupled to 85,000 by 1960 and to 138,000 in 1970. During that time, the rate of lung cancer deaths also quadrupled, from 11.3 per 100,000 in 1950 to 46.1 in 1969.

By contrast, the population in region No. 4, the extreme southeast part of the city, rose from 17,000 in 1950 to 97,000 in 1970, a sixfold increase. Yet the rate of lung cancer deaths only doubled, from 16 per 100,000 to 34.

The lowest regions are Greens Bayou, River Oaks and the southwest between Westheimer and the Southwest Freeway from S. Post Oak westward.

These regions are out of the prevailing pollution-carrying winds and have little or no industry within their borders, Prof. Macdonald notes. The second and third lowest regions have among the highest median incomes, too. Only the Memorial area has more income and it, too, is low in lung cancer incidence. It also has little if any industry.

Oddly, in the area with the highest death rate from lung cancer, the median age is only 23.9. That's among the lowest in the 16 regions. The extreme northeast area has a median age of 22 and it's the fifth from lowest in lung cancer deaths.

River Oaks, next to lowest in lung cancer deaths, has the highest median age, 34.6.

The second highest area of lung cancer incidence is in center city and down toward Mykawa Rd. to the southeast. This area has a high density of people, the work force during the day, plus industry and traffic.

The chart shows the rate of lung cancer incidence for male and female combined, but when the two are separated, the rates among men are astoundingly higher.

For instance in the Spring Branch area the rate is 80.9 per 100,000 for men but only 13.0 for women. By contrast, in the low-incidence Greens Bayou area, it's 46.9 per 100,000 for men and 9.8 for women.

Prof. Macdonald says occupational exposure and atmospheric pollution, perhaps through traveling to and from work, may account for the vast differences in the two rates.

The highest rate for females is in the Memorial area which has a low total incidence of lung cancer deaths. The lowest is in the East End between Sims Bayou and the Ship Channel.

The highest for males is in the inner city-southeast region, second highest in total incidence. The lowest is in the southwest.

Regional Lung Cancer Death Patterns In Houston

Statistics From 1965 to 1969

City Air Pollution Sampling Stations (No Number 1)	Lung Cancer Death Incidence Per 100,000	Male	Female	Area Median Age	Median Income
Number 2	41.9	83.0	12.1	23.8	$6,[illegible]
Number 3	42.2	79.6	9.0	28.5	8,064
Number 4	31.3	55.4	13.3	21.8	12,125
Number 5	42.1	70.6	14.8	23.9	10,134
Number 6	45.5	84.5	13.0	23.6	[illegible]
Number 7	35.6	64.5	10.9	30.8	7,650
Number 8	41.6	71.4	20.5	32.8	12,[illegible]
Number 9	30.2	43.5	18.7	23.8	14,[illegible]
Number 10	29.0	53.8	10.6	31.6	13,926
Number 11	46.1	80.9	13.0	23.9	11,045
Number 12	41.8	73.7	11.9	24.9	8,273
Number 13	34.0	53.4	14.5	22.0	8,767
Number 14	42.2	73.0	13.7	23.8	7,576
Number 15-16	26.3	46.9	9.8	23.9	10,253
Number 17	31.4	46.9	21.1	30.0	19,156

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Deaths by lung cancer linked to Houston air

By HAROLD SCARLETT
Post Environment Writer

Deaths from lung cancer are strikingly higher in the sectors of metropolitan Houston with the heaviest air pollution, a noted cancer epidemiologist reported Saturday.

Prof. Eleanor J. Macdonald, chief epidemiologist for the M. D. Anderson Hospital and Tumor Institute, said the profile of Houston's high-risk areas for lung cancer emerged from a massive study of all city deaths during a 30-year period.

Her department's study showed high mortality rates from lung cancer in neighborhoods near the Houston Ship Channel and the central city.

Surprisingly, the city's highest death rate from lung cancer was found in Spring Branch and the city's northwest quadrant, between the Katy Freeway and Ella Boulevard.

The annual mortality rate there during the years 1965-69 was 46.1 lung cancer deaths per 100,000 population, even though the residents' median age — 23.9 years — is one of the youngest in the

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city. Lung cancer is more common in the elderly.

Macdonald pointed out that the mortality rate in the northwest area shot up sharply in 10 years. During the 1955-59 period, there were only 27.8 lung cancer deaths per 100,000 people.

She also pointed out that in recent years, there has been a large influx of heavy industry into the area.

The average U.S. mortality rate from lung cancer during 1963, as estimated by the American Cancer Society, was 33 deaths per 100,000 population.

In the Memorial area, between the Katy Freeway and Westheimer, the death rate was 31.4 during 1965-69, and in River Oaks it was an even lower 29.

But it was 41.9 deaths in the central city and Heights area, and 42.2 in neighborhoods on both sides of the upper Ship Channel.

Macdonald said the death-rate variations in different section of Houston were statistically "enormous." She added that heart disease mortality was also generally high in the same sections with abnormal lung cancer deaths.

"I have no doubt that air pollution is involved," said the nationally known cancer epidemiologist.

"There isn't any question that some extraneous factor accounts for these differences, and I think it must be air pollution."

She said the study figures took into account the length of residence in a neighborhood and the variations in median age, income and racial composition in the different city areas.

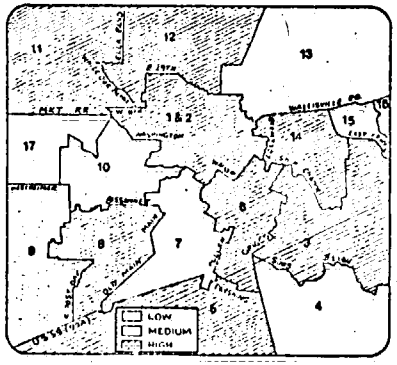
The landmark study, begun in 1966 with the cooperation of the city statistical office, appears to provide the firmest evidence yet found that Houston air pollution can be a killer.

Researchers coded, catalogued and correlated 235,000 deaths in Houston from all causes during the 1910-70 study period. For the earlier years, they had to check thousands of original death certificates to assemble the data for computer analysis.

The study showed that Houston death rates for most major diseases either held steady or declined during the 30-year period, Macdonald said.

But lung cancer deaths have climbed.

She said the lung cancer-air pollution phase of the study was limited mainly to the five-year 1965-69 period because virtually no data exists on Houston air pollution levels before that time.



Map charts pollution divisions for study

Macdonald, neither a chemist or pathologist, declined to speculate on what specific air pollutants might be responsible for the excessive lung cancer deaths in some parts of Houston.

"I don't want to be pontifical because I don't know," she said. "What I'm trying to point out is that there are differences, and let's see what we can find out and do about them."

She said Houston has a wealth of data on the different types of industry in the city's different sections, and how long they have been in operation.

"I think a very careful study should be made, not only of air pollutants but of any other factors that may be causing the differences (in death rates) around the city," she said.

The epidemiologist said low income (which could result in poor food and inadequate medical care) and advanced [illegible] are two factors in the lung cancer hot spots.

She pointed out that one study area, south of the downtown area out to Holmes Road and roughly lying between Main and Cullen, has a comparatively low median income and high median age.

Yet it had a moderate lung-cancer death rate of 35.6 per 100,000.

Surprisingly, the area west of Main around Bellaire has one of the city's higher lung-cancer mortality rates, 41.6 per 100,000.

MacDonald said far higher lung cancer deaths among men, compared to women in the same areas, could indicate greater exposure of men to pollution at their jobs, or while going to and from work.

For the study, the researchers grouped the city's standard census tracts into 17 regions, with each region surrounding one of the city's 17 air pollution sampling stations.

Here is a breakdown of the median age, median income and lung cancer death rate (LCDR) in each of the 17 regions, as shown on the accompanying map:

Region 1 — combined with Region 2.

Region 2 — age, 28.5; income, $6,399; LCDR, 41.9.

Region 3 — age, 28.5; income, $8,401; LCDR, 42.2.

Region 4 — age, 21.6; income, $12,123; LCDR, 34.2.

Region 5 — age, 22.9; income, $10,154; LCDR, 42.1.

Region 6 — age, 28.6; income, $7,250; LCDR, 47.5.

Region 7 — age, 30.5; income, $7,660; LCDR, 35.

Region 8 — age, 37.6; income, $12,222; LCDR, 31.6.

Region 9 — age, 23.6; income, $14,665; LCDR, 30.9.

Region 10 — age, 31.5; income, $13,996; LCDR, 29.

Region 11 — age, 23.5; income, $11,045; LCDR, 36.

Region 12 — age, 24.3; income, $8,833; LCDR, 41.8.

Region 13 — age, 22; income, $8,687; LCDR, 34.

Region 14 — age, 23.6; income (missing); LCDR, 42.2.

Region 15 and 16 — age, 23.9, income, $10,358; LCDR, 26.3.

Region 17 — age, 30; income, $19,196; LCDR, 31.4.

Macdonald said the Tobacco Research Council provided a $40,000 grant to pay for four extra researchers to compile data from city statistical files over a four-year period. She said the no-strings grant was paid to and disbursed by the city.

She said the results of the study, which she plans to publish soon in two scientific journals, show no discernible correlation between cigarette smoking and lung cancer deaths in the different sec-

May, 1971

NAME: Eleanor J. Macdonald

PLACE OF BIRTH: West Somerville, Massachusetts

EDUCATION:

A.B., Radcliffe College, 1928
Harvard School of Public Health, courses in Epidemiology and Statistics: E. B. Wilson, Ph.D., and Carl Doering, M.D., Ph.D.
Private Instruction - Biometry and Epidemiology: E. B. Wilson, Ph.D., Carl Doering, M.D., Ph.D., and H. L. Lombard, M.D.

REDACTED

PROFESSIONAL APPOINTMENTS:

Statistician (1930-1935) and Epidemiologist (1935-1940), Massachusetts Department of Public Health.
Visiting Lecturer in Research Methods, Tufts Dental School, 1933-1943 (one hour a week).
Lecturer in Social Sciences, Regis College, Weston, Mass., 1936-1938 (three hours a week, biometry 1 and 2).
Research Statistician, Division of Cancer Research, Connecticut State Department of Health, 1941-1948.

Member of Research Committee Social Statistics, Division of Houston Chamber of Commerce, 1949-1960.

Consultant to National Cancer Advisory Council, November, 1944-December 1946.

Consultant, Memorial Hospital, New York City, January, 1947-October, 1948 (one day a week); 1948-1950 (one day a month); by appointment, 1951-1957.

Assistant Clinical Professor, Yale University School of Medicine, Annual Lectures in Cancer Control Methodology, 1948-1960.

Biostatistician, Southwest Cancer Chemotherapy Study Group, 1957-1960.

Chairman, Definitions Committee, End Results Evaluation Section, Cancer Chemotherapy National Service Center, 1958-1959.

Statistical Consultant, Department of Pediatrics, Baylor University College of Medicine, 1958-1962.

Member, Advisory Committee on Biomathematics and Scientific Computation, The University of Texas M. D. Anderson Hospital and Tumor Institute, 1962-1963.

Consultant, Texas Medical Center Task Force on Data Processing, 1963-1964.

Consultant Epidemiologist, Texas Department of Health, 1949-1963.

Consultant Statistician to the Texas Cancer Coordinating Council, supervising construction of statewide cancer record registry in general hospitals, 1949-1963.

Member, Task Force for the Joint Committee on Staging Cancer and End Results, American College of Surgeons, 1961-1965.

Professor Biostatistics, Postgraduate School of Medicine, The University of Texas, 1948-1963.

Professor Biostatistics, Graduate School of Biomedical Sciences at Houston, The University of Texas, 1963-1965.

Professor Epidemiology, The University of Texas M. D. Anderson Hospital and Tumor Institute, 1948-.

Chairman, Education Committee, The University of Texas M. D. Anderson Hospital and Tumor Institute, 1963-1965.

Member, Program Committee, Annual Symposium Biomathematics and Computer Science in The Life Sciences, The University of Texas Graduate School of Biomedical Sciences at Houston, 1963-1965.

Member, Director's Advisory Council, The University of Texas M. D. Anderson Hospital and Tumor Institute, 1948-1959, 1963-1965.

AWARDS

Myron Gordon Award presented at the 8th International Pigment Cell Growth Conference in Sydney, Australia, March 1972.

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